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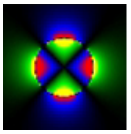
Magnet Division Procedure

Procedure: SMD-AGS-3006

Revision: A



Superconducting Magnet Division

AGS Snake Magnet Cold Mass Assembly

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- Q. A. Approval: Signature on File
- ES&H Review: Signature on File

Revision History

Rev A: Initial Release

1 Scope:

This procedure describes the steps necessary for welding the support trunnions and the magnet insertion mounts to the cold mass shell, and attaching the cold mass pre-cooling circuit to the shell of the AGS Snake magnet. Also included are appropriate inspections, testing, and leak checking.

2 Applicable Documents:

RHIC-MAG-Q-1000	Procedure for Control of Measurement Test Equipment
RHIC-MAG-Q-1004	Discrepancy Reporting Procedure
RHIC-MAG-R-7227	Electrical Resistance Measurements
RHIC-MAG-R-7228	Coil Inductance & Q Measurements
RHIC-MAG-R-7242	Hypot Testing
RHIC-MAG-R-8853	Hypot Testing – Helical Coil Insulation Assembly
BNL Dwg. 22010520	Cold Mass Assembly

3. Requirements:

3.1 Material & Equipment

Black Felt Tip Pen	BNL Stock No. S-23757

3.2 Safety Precautions:

3.2.1 Specific steps of this procedure contain electrical and mechanical assembly operations that impact the environment. Prior to performing these steps, personnel shall complete the applicable facility-specific environmental training.

4 Procedure:

4.1 Installing Trunnions on Shell

4.1.1 The trunnion installation will be done most easily by locating the cold mass on rollers so that it can be rotated somewhat about its longitudinal axis, within the freedom allowed by the buffer assemblies already present.

4.1.2 The (8) trunnions must be located accurately enough so that they give the proper angle to the support straps after insertion of the cold mass within the vacuum vessel. This can be done, with reasonable effort, by scribing lines on the shell OD relative to the accurate end plate notches.

4.1.3 See Figure 1. Consider a pair of end plate notches, one notch at the lead end and the other at the non-lead end. The vertical faces of these notches (if perfectly aligned) are in a common plane that can be projected through the shell along its length. The intersection of this plane with the shell is a line on its OD. Using Johansen blocks and a straight edge, or other suitable method, scribe this line on the shell OD for one notch pair. Repeat for the other three notch pairs to produce four lines on the shell from end to end, two on the top and two on the bottom.

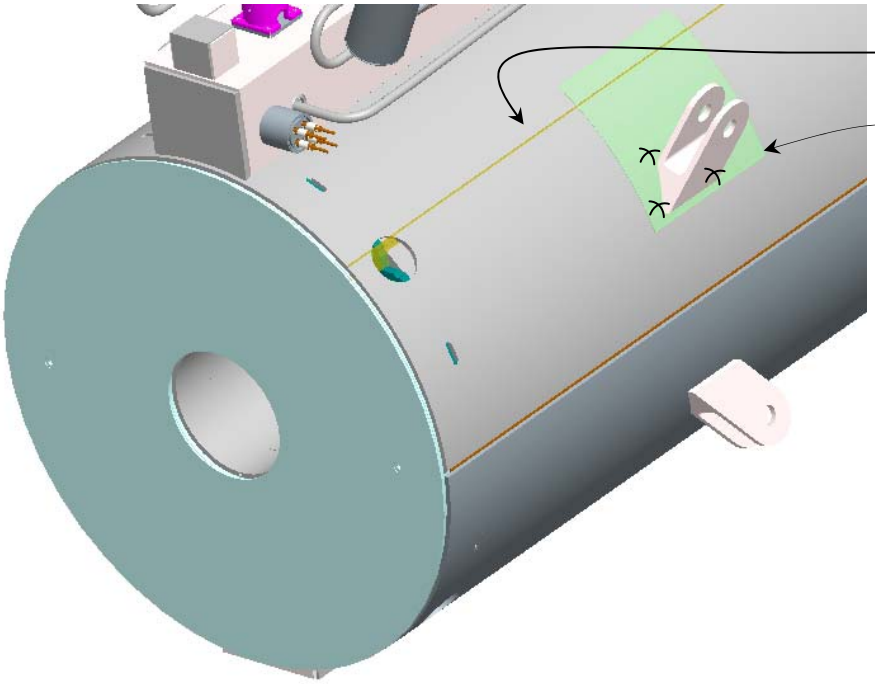

Figure 1

4.1.4 Measure a distance of 15.00 ±.015 inches from the back face of each end plate (the face in contact with the yoke laminations) along each scribe line. Use a center punch to make a small mark on the line at this point. Eight points will be punched in this manner. Circle each of these marks.

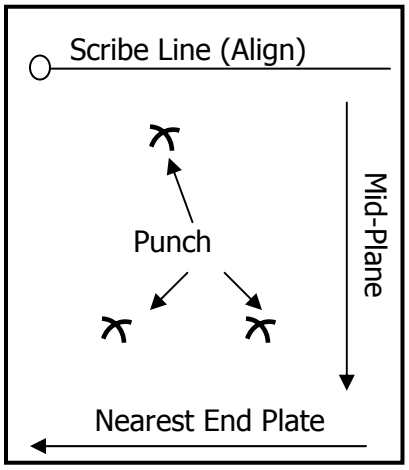

Figure 2
Template 1

4.1.5 Using Mylar Template #1 provided, align the line indicated on the template to be coincident with one of the scribe lines, placing the circle on the template concentric with the appropriate punch mark made in the previous step. Use the arrows on the template to ensure proper orientation. See Figure 1 & Figure 2

4.1.6 At each **X** on Template #1, punch a mark through the template using the center punch. Place an **X** near each of these three marks using an indelible marker, but do not obscure the punch mark.

4.1.7 Repeat steps 4.1.5 through 4.1.6 for each of the (8) circled marks made in step 4.1.4. The template should be turned over as necessary to do all (8) locations. Again, refer to the arrows to insure proper orientation at each location.

4.1.8 Place a trunnion on the shell so that the indicated corners of the trunnion are coincident with the punch marks designated by the **X**s. See Figure 1. Clamp the trunnion in place, then tack weld to shell. Repeat for all eight trunnions.

4.1.9 Final welding of the trunnions will be done later along with other welding to follow.

4.2 Installing Cold Mass Insertion Mounts

4.2.1 There are four mounts required at each end of the cold mass. Their positions are located by using Mylar Template #2.

4.2.2 Place the indicated line on template #2 along one of the scribe lines made in step 4.1.3. See Figure 3 & Figure 4. Use the arrows on the template to ensure proper orientation. The edge of the template facing the nearest end should be coincident with the outer face of the end-volume end plate. The orientation with the end-volume end plate is not critical as the mount will be aligned to be flush with its face.

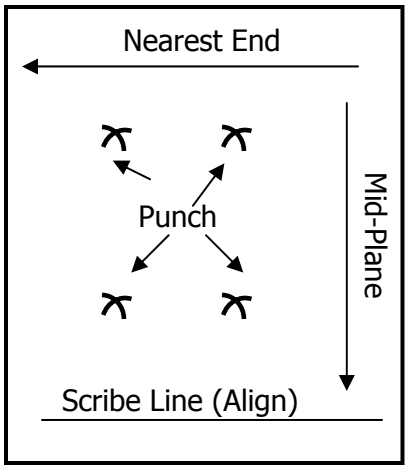

Figure 3
Template 2

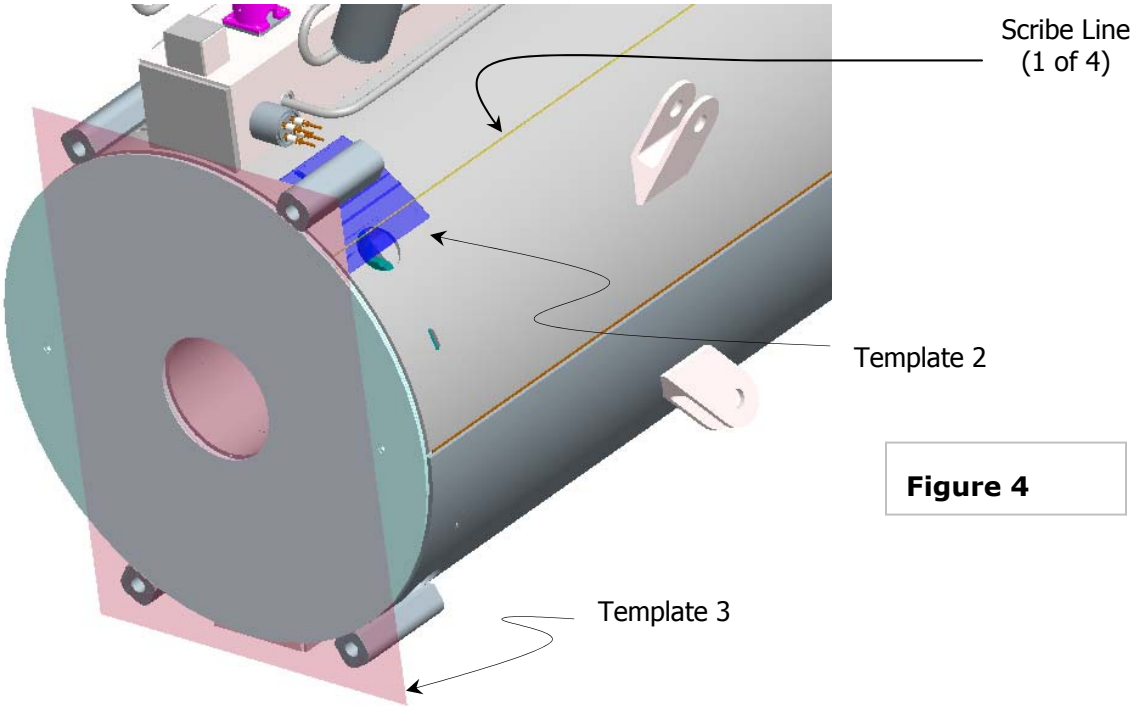

Figure 4

4.2.3 At each **X** on Template #2, punch a mark through the template using the center punch. Place an **X** near each of these four marks using an indelible marker, but do not obscure the punch marks.

4.2.4 Repeat 4.2.2 - 4.2.3 for each of the (8) mount locations. Again, refer to the arrows to insure proper orientation at each location.

4.2.5 Align the mounts to the **X**s as indicated in Figure 4. The front face of each mount shall be flush with the outer face of the end-volume end plate. Refer to drawing 22010520.

4.2.6 Tack weld the insertion mounts to the shell.

4.2.7 See Figure 4. Locate template 3 to the face of the mounts and verify proper location prior to completion of welding to follow.

4.3 Prep-For-Test Welding

4.3.1 Roll the cold mass to a convenient attitude for welding the trunnions and the insertion mounts along one side.

4.3.2 Weld the trunnions to the cold mass in accordance with drawing 22010520.

4.3.3 Weld the insertion mounts to the cold mass in accordance with the drawing.

4.3.4 Install and weld an IFS container top, P/N 22010613, on each IFS line. Be sure that wires inside are far enough away from the joint and suitably protected so that they will not be affected by weld heat.

4.3.5 Install and weld the helium fill tube extension, P/N 22010693, to the stub on top of the buffer volume. Be sure that temperature sensor wires inside are far enough away from the joint and suitably protected so that they will not be affected by weld heat.

4.3.6 Install and weld the helium fill tube cover, P/N 22010691, to the extension. Be sure that temperature sensor wires inside are far enough away from the joint and suitably protected so that they will not be affected by weld heat.

4.3.7 All Cold Mass welding should now be complete, with the exception of the survey hole cover discs. Survey must be performed prior to closure of the shell holes. This will locate the fiducial holes on the end volume plates with respect to survey notches inside the shell holes that were used during cold mass assembly.

4.3.8 Install fiducial targets having nominal .250 shanks into the end volume plates, two targets per plate. Locations are at 3 o'clock and 9 o'clock.

4.3.9 Locate the x,y,x coordinates of the targets with respect to the survey notches at each end of the cold mass.

4.3.10 Verify that survey group has saved survey data and that data appears to be self-consistent.

4.3.11 Close shell holes at 8 survey notch locations using cover discs.

4.4 Pressure Test and Leak Checking

4.4.1 Place cold mass inside pressure/vacuum test vessel.

4.4.2 Connect the nitrogen line to the fill tube cover.

4.4.3 Pressurize the cold mass to 70 psia using dry nitrogen, and hold for 15 minutes.

4.4.4 Evacuate the cold mass and perform the leak check. Maximum acceptable leak rate is 2×10^{-10} std cc/sec He.

4.5 Cold Mass Precooler Weldments

4.5.1 The following steps will be done most easily by supporting the cold mass by the insertion mounts. It cannot be rotated once the precooler sections are attached, and roller supports will interfere with the placement of the precooler sections during assembly.

4.5.2 Position the precooler weldment sub-assembly, P/N 22010441 on the cold mass. This section is placed on the left side of the cold mass as viewed from the lead end. Temporarily hold in place with clamps.

4.5.3 Position precooler assembly P/N 22010440 on the right side of the cold mass, noting where the joints between it and the previous section are to be made. The tubing on 22010440 will most likely need to be trimmed slightly to provide a suitable joint for fit-up and welding (2 locations).

4.5.4 Mark, remove, and trim the right side section. Re-install on cold mass, joining the left and right sections together mechanically. While installing pre-cooler sections on outside of cold mass, place one piece of copper mesh 22010523 under each longitudinal tube. Mesh needs to be centered by eye only. Temporary Kevlar cord ties may be helpful in holding mesh sections in place on tubing before pre-cooler sections are mounted on shell. Check for proper azimuthal orientation with respect to the buffer volumes, trunnions, and support mounts. Check for good thermal contact with shell OD. Tack weld and complete the welding required to join the two sections.

4.5.5 Center the precooler sections lengthwise on the cold mass. Be sure to maintain the proper azimuthal orientation with respect to the buffer volumes, trunnions, and support mounts.

4.5.6 Install precooler clips, P/N 22010471, over the longitudinal tubes at the center of the cold mass. Weld in place in accordance with drawing 22010520. These and subsequent clips must hold tubing in good thermal contact with shell OD.

4.5.7 Add the balance of the precooler clips at the locations noted on the drawing. At these positions the clips are welded ONLY to the cold mass shell, NOT to the tubing.

4.5.8 Remove Kevlar cord from pre-cooler sections once sections have been anchored to shell with clips.

4.6 Weld Inspections

4.6.1 Call for a certified weld inspector to inspect and sign off on the following welds:

- End Volume OD
- End Volume ID
- Upper Buffer
- Lower Buffer
- (8) Trunnions
- (8) Insertion Mounts
- (8) Cover Discs
- (2) Pre-Cooler Joints

5 Quality Assurance Provisions

5.1.1 The Quality Assurance provisions of this procedure require that the technician be responsible for performing all assembly operations in compliance with the procedural instructions contained herein and the recording of the results on the production traveler.

5.1.2 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported in accordance with RHIC-MAG-Q-1004.

5.1.3 Measuring and test equipment used for this procedure shall contain a valid calibration label in accordance with RHIC-MAG-Q-1000.

6 Preparation For Delivery
N/A